

THE EFFECT OF HERD MANAGEMENT AND MATERNAL FACTORS ON CALVES HYGIENE

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Received: Nov. 5, 2023

Accepted: Nov. 25, 2023

ABSTRACT: Records of 1810 growing Holstein calves, born in 2018 to 2019; from birth up to weaning, were used in this study to declare the effects of management and maternal factors (housing system, season, gender, birth weight, dam parity and calving interval) on different diseases. Non-parametric correlation coefficients among diseases were done. These records are from a commercial farm named El-Baiomy dairy farm located in Gamasa-Dakahlia province, Egypt. The calves were housed in two different housing systems. The first one (semi-indoor) the calves were housed individually in special boxes (with a floor of iron insulated with a plastic layer and raised from the ground by 20 cm) for the first 21 days after birth and then they were relocated in conventional boxes on sand bedding till weaning. On the other hand, the calves in station 2 (outdoor housing systems) were housed directly after birth in the conventional calf's boxes. About 1026 calves (56.66%) exposed to different diseases. The highest incidence of diarrhea was 53.15% in semi indoor system but it was 46.84% in outdoor system. Furthermore, outdoor system recorded the highest incidence of pneumonia, navel ill, lameness, weakness, arthritis and conjunctivitis (71.87%, 100%, 56.50%, 94.91%, 53.33% and 74.19% respectively). Winter season was associated with the highest incidence of calves' diseases such as pneumonia, diarrhea, arthritis, weakness, lameness and conjunctivitis (37.80%, 42.60%, 36.55%, 40.00%, 38.98% and 31.25%, respectively). This confirmed that 1) The importance of warming the calves, especially through good and comfortable bedding; 2) Protect the calves from the air currents; 3) Maintaining the cleanliness of the bedding under the animals. Males recorded the highest incidence of diarrhea ($P<0.05$), pneumonia ($P<0.01$), lumpy skin ($P>0.05$), lameness ($P<0.05$), weakness ($P<0.01$), arthritis ($P>0.05$) and conjunctivitis ($P<0.01$) (56.90%, 65.20%, 63.60%, 81.30%, 88.10%, 66.70% and 68.80% respectively). This may be due to using artificial suckling systems based on milk replacers for male only. Calving interval had not any significant effect ($P>0.05$) on the incidence of calves' diseases. The calves that born from 1st parity dams recorded the highest incidence of diarrhea, pneumonia, arthritis and conjunctivitis (36.99%, 33.70%, 46.66% and 31.18 % resp), which need intensive care. Some calves diseases correlated positively or negatively significant ($P<0.05$) with other diseases which needs more research studies. But the negative association between diarrhea and the rest of the diseases was due to the drugs and treatments, intensive care, used to treat diarrhea have an effect in preventing other diseases.

Key words: Housing system, season, gender, birth weight, dam parity, calving interval, pneumonia, navel ill, lameness, weakness, arthritis and conjunctivitis

INTRODUCTION

Calves are the future income of the farm and sustainability of farm depend on them. Calf managements are important as they help calves in reaching their full genetic potential and can produce healthy herd replacement animals (Thakur and Gupta, 2016). A disease is the most significant reason for mortality in calves

(Svensson *et al.*, 2006b; and Sivula *et al.*, 1996) and reduces growth rates (Schmoldt *et al.*, 1979). The newborn calf is almost unprotected against infectious diseases and the early phase of the young animal's life is so crucial because the calves are too susceptible to the environmental and housing factors such as floor and bedding materials (Kartal and Yanar, 2011).

Some farms fulfill low mortality rates; it indicates that losses can be avoided when good management practices are in place. Good management at calving is the essential first step to successful calf rearing. Adopting a standard procedure for calving management and supervision will reduce calving mortality; the bovine placenta does not permit the passive transfer of antibody to the fetus (Cho and Yoon, 2014). As a result, the newborn calf does not receive any antibody from the dam and is very susceptible to environmental pathogens. Placing calf pens in a draughty area of the barn can affect the animals' disease resistance (Gulliksen, 2010).

Harsh weather conditions such as low temperatures, rain, wind, and high levels of moisture act as stress factors to young calves and increase the susceptibility of calves to diarrhea (Gulliksen *et al.*, 2009; Carroll and Forsberg, 2007; Larson and Tyler, 2005).

A cow's performance, as well as that of heifer and the calf, is to a large extent was affected by dry cow feeding and management quality. Hence, it is fair to say that future calf and heifer performance begins before birth. Optimal management and proper dry cow and pregnant heifer nutrition ensure the birth of healthy, strong calves and optimal start of cow lactation. (Gustaf, 2020)

Wittum *et al.* (1994) reported an increased risk of general morbidity among calves from first-calving beef cows. Simensen and Norheim (1983) found that the highest and thriftiness scores among calves from primiparous dairy cows, however Curtis *et al.* (1988) found parities to be negatively associated with the risk of respiratory disease.

The potential for growth and healthy newborn calf is largely influenced by the health and metabolic status of their dam. Much of the focus of cow management has been on the perinatal period as the calf prepares for delivery into a totally foreign environment in which placentally derived nutrition is replaced by the initial lacteal secretion from the mammary gland, colostrum (Eivazi *et al.*, 2013).

The aims of the present study were to describe the effect of management and maternal factors on calves' diseases.

MATERIAL AND METHODS

Animals and Study location

The records of 1810 growing Holstein Friesian calves, born in 2018 and 2019; from birth up to weaning, were used in this study. These records are from a commercial farm named El-Baiomy dairy farm located in Gamasa-Dakahlia province, Egypt. This farm specialized in milk production, consisted of 2000 Frisian dairy cattle and their consequent. This farm represents some modern production systems applied in Egypt that follows a widespread production pattern with special management system.

Ethical approval

The present work has been conducted in accordance with the guidelines of the scientific research ethics and animal use committee (SRE & AUC) – Faculty of Agriculture – Menoufia University, Egypt.

Approval No: 05 – SRE & AUC-MUAGR - 09-2023

Management

Once the calf is delivered it was separated away from its dam and the mucus on its nose and mouth were removed by stockman finger to help it to breathe and rub it down for several minutes using a towel or clean straw. This stimulates the calf's circulation and removes moisture which reduces heat loss and prevents calf from diseases. After that, the new born calves were weighed, identified by ear plastic tags numbers and housed expeditiously in its box and feed colostrum as planned.

Housing system

This farm was divided into two management systems (two stations). Dairy cows in both management systems were housed in similar pens as loose housing system in open half-shaded pens. However the calves were housed in different housing systems. In the first one (semi-indoor), the calves were housed individually in

special boxes for the first 21 days after birth (Fig. 1) and then they were relocated in conventional boxes (Fig. 2) on sand bedding till weaning.

The boxes were placed in parallel rows in special contiguous boxes, with a floor of iron insulated with a plastic layer, under a large galvanized iron sheet with a height of 5 meters. The boxes of calves were raised from the ground 20 cm and installed on concrete floors with

tendencies to facilitate the drainage of feces and urine away from the calves. The dimensions of these boxes were 110×70×100 cm for long, wide and height respectively. Scalded metal barrier was provided between each animal to prevent the calves licking behaviour. Boxes cleaning were done twice daily (9 am and 3 pm) using water rush on concrete floor and the boxes were sanitized periodically every month.



Fig. (1): Calves semi-indoor housing systems in the first station (first management system).



Fig. (2): Calves outdoor housing systems in the second station (second management system)

After the first period of calving (starting from 22 day up to weaning) the calves were relocated on sand bedding in iron conventional boxes (Fig. 2). These boxes measured 200×100×115cm for long, wide and height, resp. and were sheeted entirely and individually by galvanized iron. The boxes were placed 50-100 cm apart in rows, to prevent calves licking behaviour. The cleaning was done every 2 and/or 5 days in summer and/or winter respectively; by relocated the boxes on clean sand bedding.

The special and conventional boxes were provided by two vessels one for starter, special ration for calves, and the other for milk and/or water. The starter vessels were available all over

24 hours; however the water vessels were lifted 2 hours prior to milk feeding and were available the rest of day.

On the other hand the calves in station 2 (outdoor housing systems) were housed directly after birth in the conventional calf's boxes, as illustrated previously, till weaning (Fig. 2).

Studied criteria

Calves diseases and health care

The most common calves' diseases were recorded in this study are listed in Table (1) during 2018-2019.

Table 1: Most common calves' diseases identified in the present study

Calves identified diseases	DESCRIPTION	References
Navel ill	The Navel portion of the calf is infected, by bacteria's contamination of umbilicus following parturition.	Naik <i>et al.</i> , 2011
Pneumonia	Abnormal clinical signs related to the respiratory tract:- <ul style="list-style-type: none"> • Inducible cough on tracheal massage. • Abnormal auscultation sounds on auscultation of the respiratory tract. • Evidence of elevated body temperature (>39.5°C). 	Virtala <i>et al.</i> , 1996
Diarrhea	soft or watery feces lasting for 2 or more days, possibly in combination with impaired general condition or weight loss	Svensson <i>et al.</i> , 2003
Lumpy skin	Fever, multiple firm, circumscribed skin nodules, and necrotic plaque in the mucous membranes (chiefly of the upper respiratory tract and oral cavity), mastitis, orchitis and swelling of the peripheral lymph nodes.	Coetzer and Eeva 2004
Lameness	<ul style="list-style-type: none"> • Lameness in cattle involves the structures of the foot; specifically, one or both of the component digits of the bovine foot located below the level of the fetlock (ankle). • Sole ulcers, white line disease (defects in the sole at the junction with the vertical hoof walls), and interdigital necrobacillosis (footrot) are the most common foot disorders that create lameness in cattle. 	Van Metre, 2005
Pinkeye (conjunctivitis)	<ul style="list-style-type: none"> • Inflammation of the cornea (the clear outer layer) and conjunctiva (the pink membrane lining the eyelids) of the eye. • Will also cause ulceration, which looks like a hole or depression in the cornea. 	Whittier <i>et al.</i> , 2009
Arthritis	An acute inflammatory response after bacterial contamination of the joint. This reaction initiates a rapid influx of inflammatory cells, mostly neutrophils, as well as activation of synoviocytes and chondrocytes, release of many inflammatory mediators, and finally decreased proteoglycan synthesis. This cascade of events ultimately leads to a reduction in joint lubrication and an increase in cartilage destruction, thus contributing to the process of joint disease.	Bertone 1996
Weaknesses	Low body weight anemia, depression, weakness, variable body temperature, a reddened and crusty muzzle, and ataxia.	Radostits <i>et al.</i> , 2000

Statistical analysis

Non-parametric Correlation coefficients among dam's related factors, management related factors and diseases were done by spearman rho using two-tailed test using SPSS (Statistical Package for Social Science) program version IBM statistics 22.

RESULTS AND DISCUSSION

The total number of calves born in 2018-2019 was 1810 calves, of which 1026 calves (56.66%) exposed to different diseases.

Diseased calves in different housing systems

Number of diseased calves in different housing systems is listed in Table 2 and Fig. 3. The highest incidence of diarrhea was 53.15% in semi indoor system but it was 46.84% in outdoor system. This could be due to the different box design which allows the air to pass under the calves in semi indoor system (the boxes are higher about 20 cm from the ground). The difference between both systems was highly significant ($P < 0.01$). The calves bedded with sand seemed to get colder at night making it more difficult for them to get comfortable and curl up to sleep. These calves also showed more

scours and required more medical attention when compared to calves bedded on rice hulls, shavings or straw (Hill *et al.*, 2011).

Furthermore, outdoor system recorded the highest incidence of pneumonia, navel ill, lameness, weakness, arthritis and conjunctivitis (71.87%, 100%, 56.50%, 94.91%, 53.33% and 74.19% resp.). However the comparable values were 28.12%, 0%, 43.75%, 5.08%, 46.60% and 25.80 % in semi indoor system, respectively. But (Callan and Garry, 2002; Woolums *et al.*, 2007; Maunsell and Donovan, *et al.*, 2008) noted that the individual calf hutch placed in an outdoor environment often provides the best environment for the prevention of respiratory and other diseases of calves.

These differences could be attributed to bad healthy management of calves in outdoor system; that leaves bedding contaminated with urine and feces for long time which moisturizes the housing place. It had highly significant effect ($P < 0.01$) on pneumonia, weakness and conjunctivitis but non-significant ($P > 0.05$) on navel ill, lameness and arthritis. Calves housed outdoor outperform other calves in semi-indoor with healthy skin (only 27.27% lumpy skin) however more calves reared in semi indoor system were infected significantly by 72.72%.

Table (2): Number of diseased calves in different housing systems (in %).

Housing system	Number of illness cases		Diarrhea	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	Conjunctivitis
Semi-indoor system	504 (39.8%)	N _o	329	126	0	8	7	3	7	24
		%	53.15	28.12	0.00	72.72	43.75	5.08	46.60	25.80
Out-door system	760 (60.1%)	N _o	290	322	3	3	9	56	8	69
		%	46.84	71.87	100	27.27	56.25	94.91	53.33	74.19
Sig.			**	**	NS	*	NS	**	NS	**
Overall Mean	1264	N _o	619	448	3	11	16	59	15	93
		% of total cases	48.97	35.44	0.23	0.87	1.26	4.67	1.18	7.36

($P > 0.05$) non-significant (NS), *significant ($P < 0.05$), ** significant ($P < 0.01$).

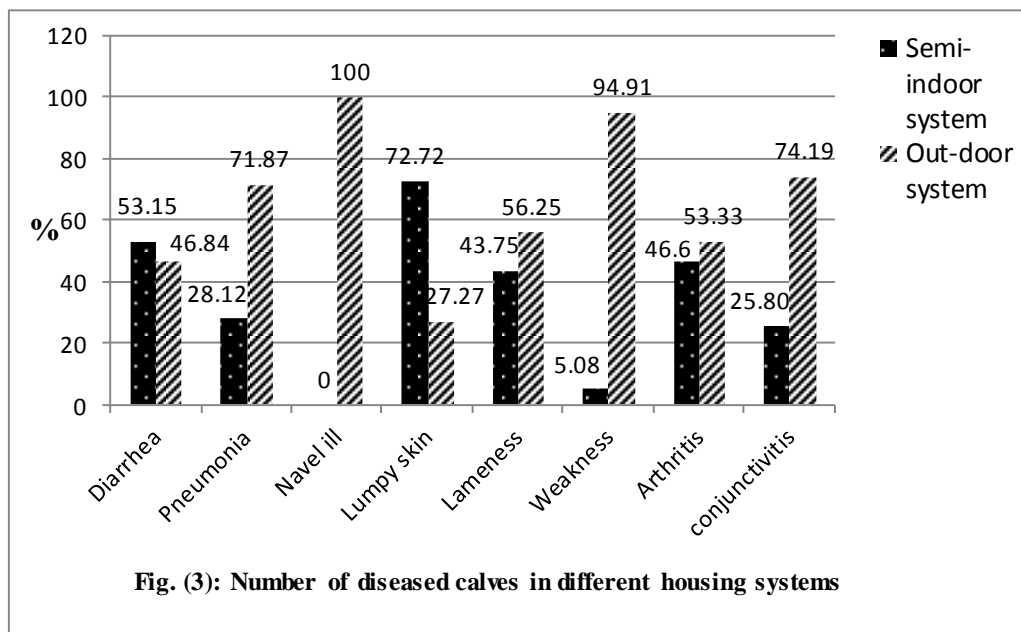


Fig. (3): Number of diseased calves in different housing systems

Results revealed that there was highly significant effect of housing systems on calf's diarrhea and pneumonia. Calves reared in semi-indoor system were more infected with diarrhea (53.15%) and less infected with pneumonia (28.12%) than those reared in outdoor system that infected with less diarrhea (46.84%) and higher pneumonia (71.87%). Which confirm that: 1) The importance of warming the calves, especially through good and comfortable bedding; 2) Protect the calves from the air currents; 3) Maintaining the cleanliness of the bedding under the animals.

Diseased calves in different calving seasons

Numbers of diseased calves in different calving seasons were listed in Table 3 and Fig. 4. There was highly significant effect ($P < 0.01$) of seasons on diarrhea infection. The highest incidence of diarrhea was 37.80% in winter followed by 31.60%, 23.90% and 6.60% in autumn, summer and spring respectively. This result could be due to weather variation that occurs as a result of the transmission from hot to cold weather. Harsh weather conditions such as low temperatures, rain, wind, and high levels of moisture act as stress factors to young calves and increase the susceptibility of calves to diarrhea

(Gulliksen *et al.*, 2009; Carroll and Forsberg, 2007; Larson and Tyler, 2005).

There was highly significant effect ($P < 0.01$) of seasons on pneumonia. The highest incidence of pneumonia was observed in winter (42.60%) followed by 21.90%, 18.50% and 17.00% in autumn, spring and summer respectively. The highest rate of pneumonia in winter could be related with the presence of cold air in this season in Egypt which predisposes calves pneumonia and other diseases. Respiratory diseases are often detected during autumn and winter (Svensson *et al.*, 2006a).

Also, winter recorded non-significantly, the highest incidence of lameness, weakness, arthritis and conjunctivitis (31.20%, 39.00%, 40.00%, and 36.60% respectively). However, the lowest incidence of weakness was observed in summer (17.00%). Spring recorded the lowest incidence of lameness, arthritis and conjunctivitis (18.80%, 6.70% and 19.40% respectively), but navel ill was higher in spring (66.70%). Cook (2003) reported that one of the most important environmental factors affecting lameness is season, with the risks being greater in winter than in summer most likely reflecting the fact that most cows are housed in the winter. Wet weather conditions in winter are also conducive to maintaining high bacterial levels.

Table (3): Number of diseased calves in different calving seasons (in %).

Season	Number of illness cases	No	Diarrhea	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	Conjunctivitis
			%	%	%	%	%	%	%	%
Winter (39%)	493	No	234	191	0	0	5	23	6	34
		%	37.80	42.63	0.00	0.00	31.25	38.98	40.00	36.55
Spring (12.8%)	162	No	41	83	2	1	3	13	1	18
		%	6.62	18.52	66.66	9.09	18.75	22.03	6.66	19.35
Summer (21.4%)	271	No	148	76	1	7	4	10	3	22
		%	23.90	16.96	33.33	63.63	25.00	16.94	20.00	23.65
Autumn (26.7%)	338	No	196	98	0	3	4	13	5	19
		%	31.66	21.87	0.00	27.27	25.00	22.03	33.33	20.43
Sig.			**	**	*	**	NS	NS	NS	NS
Overall mean	1264	No	619	448	3	11	16	59	15	93
		% of total cases	48.97	35.44	0.23	0.87	1.26	4.67	1.18	7.36

(P>0.05) non-significant (NS), *significant (P<0.05), ** significant (P<0.01).

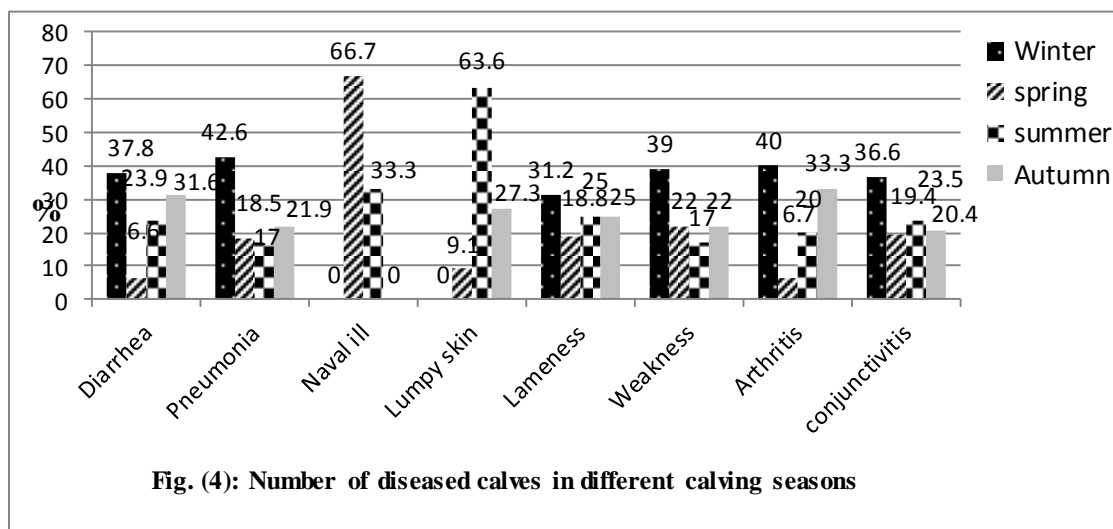


Fig. (4): Number of diseased calves in different calving seasons

Generally, winter season was associated with the highest incidence of calves' deceases such as pneumonia, diarrhea, arthritis, weakness, lameness and conjunctivitis (37.80%, 42.60%, 36.55%, 40.00%, 38.98% and 31.25%, respectively). However, summer season was related with lumpy skin and navel ill (63.63% and 66.66%, respectively).

Diseased calves in both genders

Table 4 and Fig. 5 show the number of diseased calves in both genders. Gender had a significant effect (P<0.05) on diarrhea and lameness, highly significant effect (P<0.01) on pneumonia, weakness and conjunctivitis and non-significant (P>0.05) on navel ill, lumpy skin

and arthritis. Males recorded the highest incidence of diarrhea, pneumonia, lumpy skin, lameness, weakness, arthritis and conjunctivitis (56.86%, 65.17%, 63.63%, 81.25%, 88.13%, 66.66% and 68.81% respectively). However, these diseases affected the females with the following percentages: 43.13%, 34.82%, 36.36%, 18.75%, 11.86%, 33.33% and 31.18% respectively. While the incidence of navel ill was (66.66%) in female and (33.33%) in male. This may be due to using artificial suckling systems based on milk replacers for male only. Which may cause disease; but females suckled whole

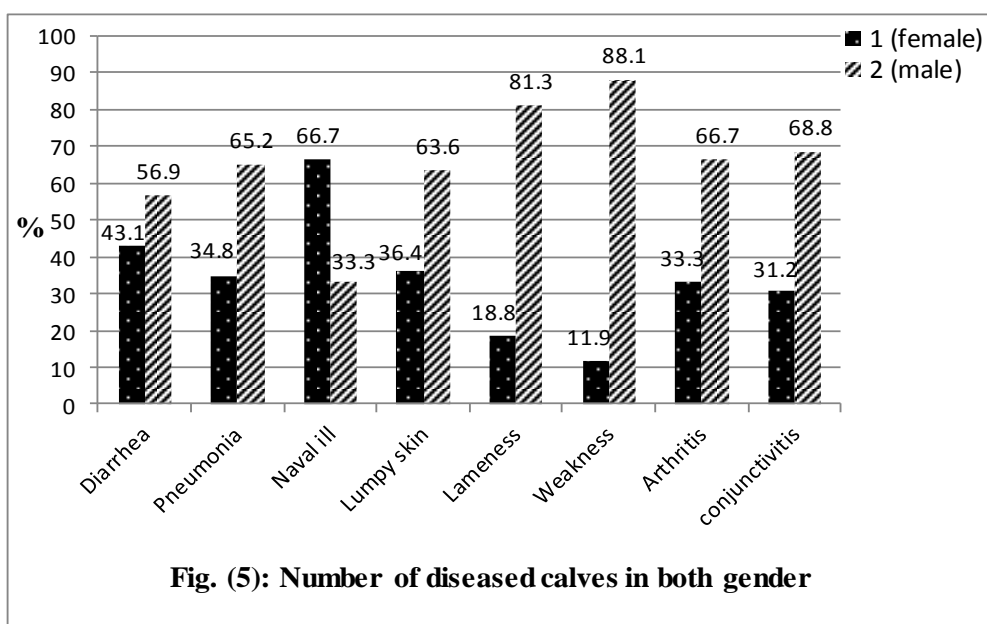
milk allover suckling period; However more research should be applied in the future to explain the really reasons for these differences between males and females.

The bovine placenta does not permit the passive transfer of antibody to the fetus. As a result, the newborn calf does not receive any antibody from the dam and is very susceptible to environmental pathogens (Cho and Yoon 2014). While the incidence of navel ill was been (66.66%) resp. in female and (33.33%) in male.

Table (4): Number of diseased calves in both gender (in %)

Gender	Number of illness cases									
		Diarrhea	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	conjunctivitis	
Female (37.4%)	N ₀	267	156	2	4	3	7	5	29	
	%	43.13	34.82	66.66	36.36	18.75	11.86	33.33	31.18	
Male (62.6%)	N ₀	352	292	1	7	13	52	10	64	
	%	56.86	65.17	33.33	63.63	81.25	88.13	66.66	68.81	
Sig.		*	**	NS	NS	*	**	NS	**	
Overall mean	N ₀	619	448	3	11	16	59	15	93	
	% of total cases	48.97	35.44	0.23	0.87	1.26	4.67	1.18	7.36	

(P>0.05) non-significant (NS), *significant (P<0.05), ** significant (P<0.01).



Diseased calves with different calves' birth weight

Numbers of diseased calves with different calves' birth weight were listed in Table 5. The incidence of almost studied diseases was associated with the highest birth weight group (≥ 35 kg); where noticed 444 illness case followed by 414 illness case with lowest birth weight (≤ 30 kg) on the other hand the mid birth weight group (31-34 kg) were 399 case.

Navel ill and Lumpy skin were the highest with heaviest birth weight group (≥ 35 kg) (66.7 and 45.4% respectively) followed by the lowest birth weight group (≤ 30 kg) (33.3 and 36.4% respectively) but the mid birth weight group (31-34 kg) scored the lowest (0.0 and 18.2 % resp.). Weakness, Arthritis and Conjunctivitis were the highest with heaviest birth weight group (≥ 35 kg) (50.8, 46.1 and 46.2% respectively) followed by the mid group (31-34 kg) (28.8, 30.7 and 31.2 % resp.) but the lowest birth weight group (≤ 30 kg) scored the lowest (20.4, 23.1 and 22.6 % resp.). These differences were highly significant with weakness and Conjunctivitis but didn't reach to significance level for the rest diseases. This may be due to dystocia with heavy calves' birth weight.

On the other hand, animals with low birth weight were more likely to suffer from diarrhea, as 219 animals (35.5 % of ill calves) had diarrhea their birth weight was ≤ 30 kg. While 209 calves (33.9 % of ill calves) had ≥ 35 kg. birth weight were infected. but the differences among studied groups were not significant. Birth weight did not affect the infection of calves with pneumonia, as the infection rate was almost equal for all studied weights.

Diseased calves in different dam parities

Table 6 and Fig. 6 show the number of diseased calves in different dam parities. 1st parity recorded the highest incidence of diarrhea, pneumonia, arthritis and conjunctivitis (36.99%, 33.70%, 46.66% and 31.18 % respectively). However, the values for calves' diseases were 2.42%, 4.91%, 0.00% and 6.45% respectively in 5th parity. In 6th parity these diseases were 3.71%, 5.58%, 6.66 % and 2.15% resp. As the mother got older, exposed to many diseases which give the calf more antibodies, so calves have less disease. Parity had non-significant effect ($P > 0.05$) on diarrhea, pneumonia and arthritis. But had highly significant ($P < 0.01$) effect on conjunctivitis.

Table (5): Number of diseased calves with different birth weight (in %).

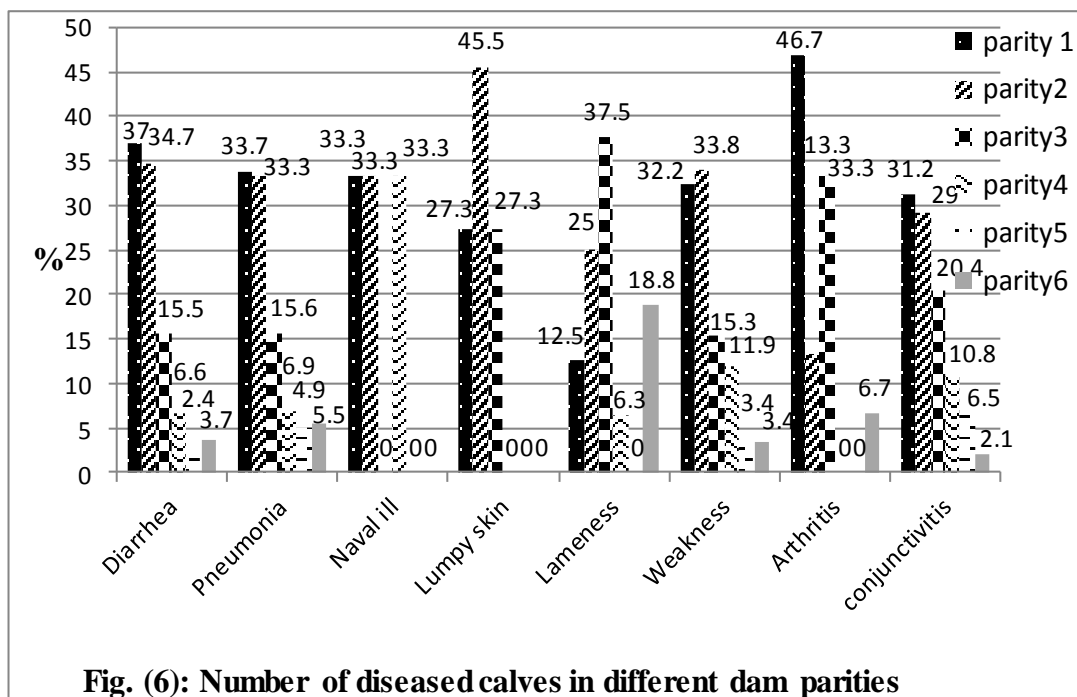
Birth weight	Number of illness cases		Diarrhea	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	Conjunctivitis
Overall mean	1257	N _o	616	447	3	11	15	59	13	93
≤ 30 kg	414 (32.9%)	N _o	219	151	1	4	3	12	3	21
		%	35.5	33.8	33.3	36.4	20.0	20.4	23.1	22.6
31-34 kg	399 (31.7%)	N _o	188	152	0	2	7	17	4	29
		%	30.5	34.0	0	18.2	46.7	28.8	30.7	31.2
≥ 35 kg	444 (35.3%)	N _o	209	144	2	5	5	30	6	43
		%	33.9	32.2	66.7	45.4	33.3	50.8	46.1	46.2
Sig.			NS	NS	NS	NS	NS	**	NS	**

($P > 0.05$) non-significant (NS), *significant ($P < 0.05$), ** significant ($P < 0.01$).

Table (6): Number of diseased calves in different dam parities (in %)

parities	Number of illness cases		Diarrhea	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	conjunctivitis
1.	441	Nº	229	151	1	3	2	19	7	29
	(34.9%)	%	36.99	33.70	33.33	27.27	12.50	32.20	46.66	31.18
2.	423	Nº	215	149	1	5	4	20	2	27
	(33.5%)	%	34.73	33.25	33.33	45.45	25.00	33.89	13.33	29.03
3.	208	Nº	96	70	0	3	6	9	5	19
	(16.5%)	%	15.50	15.62	0.00	27.27	37.50	15.25	33.33	20.43
4.	91	Nº	41	31	1	0	1	7	0	10
	(7.2%)	%	6.62	6.91	33.33	0.00	6.25	11.86	0.00	10.75
5.	45	Nº	15	22	0	0	0	2	0	6
	(3.5%)	%	2.42	4.91	0.00	0.00	0.00	3.38	0.00	6.45
≥ 6	56	Nº	23	25	0	0	3	2	1	2
	(4.4%)	%	3.71	5.58	0.00	0.00	18.75	3.38	6.66	2.15
Sig.			NS	NS	NS	NS	*	NS	NS	**
Overall mean	1264	Nº	619	448	3	11	16	59	15	93
		% of total cases	48.97	35.44	0.23	0.87	1.26	4.67	1.18	7.36

(P>0.05) non-significant (NS), *significant (P<0.05), ** significant (P<0.01).



It is clearly appearing that the highest incidence of lumpy skin in calves was 45.45% in parity 2, followed by 27.27% in parity 1 and 3 and finally (0.00%) in parity 4, 5, and 6 (Table 5). The highest incidence of calves' lameness observed were 37.50% in parity 3 followed by 25 % in parity 2 then 18.75% in parity 6. The lowest value of 12.50%, 6.25% and 0.00 % were observed in parity 1, 4 and 5 respectively. These differences were significant. Calves with navel ill accounted for 33.30 % in parity 1, 2 and 4 and 0.00% in parity 3, 5 and 6, while the differences were non-significant ($P>0.05$).

The highest incidence of weakness was observed in parity 1 and 2 (32.20% and 33.89% respect.), while the medium values were observed in parity 3 and 4 (15.25% and 11.86%, respect.) and the lowest values were found in parity 5 and 6 (3.38% and 3.38 % resp.). These differences were also non-significant ($P>0.05$).

Wittum *et al.* (1994) reported an increased risk of general morbidity among calves from first-calving beef cows. Growth in calves from first-parity cows was lower than in calves from older cows. Calves with an inadequate immunoglobulin (IgG) concentration in their blood have an increased risk of morbidity (Wittum and Perino, 1995; Donovan *et al.*, 1998).

Calves of 1st parity cows had highly significant effect ($P< 0.01$) on conjunctivitis while there was non-significant effect ($P>0.05$) on diarrhea, pneumonia and arthritis. Furthermore, these calves of 1st parity cows recorded the highest incidence of diarrhea, pneumonia, arthritis and conjunctivitis (36.99%, 33.70%, 46.66% and 31.18% resp.).

Diseased calves in different dam calving interval

Table 7 shows the number of diseased calves according to last calving interval of dams. Long calving interval (≥ 366 days) recorded the highest incidence of all diseases studied: diarrhea, pneumonia, navel ill, lumpy skin, lameness, weakness, arthritis and conjunctivitis (66.92%, 69.02%, 50.00%, 62.50%, 85.71%, 75.00%, 87.50% and 68.75% respectively). However, the incidence of diarrhea, pneumonia, navel ill, lumpy skin, lameness, weakness, arthritis and conjunctivitis were 30.76%, 29.29%, 50.00%, 37.50%, 14.28%, 25.00%, 12.50% and 29.69% for calves belonging to cows with calving interval of 331-365 days respectively. Calves belonging to cows with short calving interval (≤ 330 days) found to be diseased with 1.56% conjunctivitis, 1.68% pneumonia and 2.30% diarrhea. All these effects were not significant ($P>0.05$).

Table (7): Number of diseased calves in different dam calving interval (in %)

Calving interval	Number of illness cases		Diarrhea	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	Conjunctivitis
≤ 330 days	15 (1.8%)	N _o	9	5	0	0	0	0	0	1
		%	2.30	1.68	0.00	0.00	0.00	0.00	0.00	1.56
331-365 days	243 (29.5%)	N _o	120	87	1	3	2	10	1	19
		%	30.76	29.29	50.00	37.50	14.28	25.00	12.50	29.69
≥ 366 days	565 (68.7%)	N _o	261	205	1	5	12	30	7	44
		%	66.92	69.02	50.00	62.50	85.71	75.00	87.50	68.75
Sig.			NS	NS	NS	NS	NS	NS	NS	NS
Overall mean	823	N _o	390	297	2	8	14	40	8	64
		% of total cases	47	36.10	0.24	0.97	1.70	4.9	0.97	1.90

($P>0.05$) non-significant (NS).

Calving interval had not any significant effect ($P>0.05$) on the incidence of calves' diseases. However it is interesting to find out that calves belonging to cows with long calving interval (≥ 366 days) recorded the highest incidence of all diseases studied while those belonging to cows with short calving interval (≤ 330 days) recorded few diseases. It is clear that researches published in this area are relatively few and require additional specialized studies.

Correlation coefficients among different calves' diseases studied

Table 7 shows correlation coefficients among calves diseases studied. From this table it is obvious that, diarrhea correlated negatively and highly significant ($P<0.01$) with pneumonia ($r=-0.633$), lumpy skin ($r=-0.090$), weakness ($r=-0.176$) and conjunctivitis ($r=-0.271$) resp. while correlated negative but only significant ($P<0.05$) with navel ill ($r=-0.067$) on the other hand diarrhea non-significant ($P>0.05$) negatively with lameness and arthritis ($r=-0.050$) respectively. The negative association between diarrhea and the rest of the diseases is due to the drugs and treatments, intensive care, used to treat diarrhea have an effect in preventing other diseases. On the other hand Svensson *et al.* (2006a) showed that calves diagnosed with diarrhea during their first months of life had a significantly higher risk

of respiratory disease than calves without previous diarrhea.

It is clearly appear that, pneumonia correlated negatively and highly significant with conjunctivitis ($r=-1.00$) but it had positive correlation with lumpy skin ($r=0.004$) and weakness ($r=0.010$) resp. While correlated non-significant ($P>0.05$) negatively with navel ill ($r=-0.011$), lameness ($r=-0.009$) and arthritis ($r=-0.047$) respectively.

Navel ill correlated non-significant negatively with lumpy skin ($r=-0.006$), lameness ($r=-0.007$), weakness ($r=-0.013$), arthritis ($r=-0.006$) and conjunctivitis ($r=-0.017$) resp. Umbilical cord care has been shown to reduce the risk of arthritis (Bennett and Jasper, 1978) and respiratory disease (Perez *et al.*, 1990).

Lumpy skin correlated positively and highly significant ($P<0.01$) with weakness ($r=0.177$). While it correlated non-significant ($P>0.05$) negatively with lameness ($r=-0.013$), arthritis ($r=-0.012$) and conjunctivitis ($r=-0.033$) resp.

Lameness had positive correlation with weakness ($r=0.005$) but it had a negative correlation with conjunctivitis ($r=-0.010$) resp. while correlated positively and highly significant with arthritis ($r=0.277$) resp.

Table (8): Correlation coefficients among different calves' diseases studied.

	Pneumonia	Navel ill	Lumpy skin	Lameness	Weakness	Arthritis	Conjunctivitis
Diarrhea	-.633**	-.067*	-.090**	-.050	-.176**	-.050	-.271**
Pneumonia		-.011	.004	-.009	.010	-.047	-1.00**
Navel ill			-.006	-.007	-.013	-.006	-.017
Lumpy skin				-.013	.177**	-.012	-.033
Lameness					.005	.277**	-.010
Weakness						-.028	.505**
Arthritis							-.036

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

It is clearly appear that, weakness had a negative correlation with arthritis ($r=-0.028$) but it had highly significant ($P < 0.01$) positive with conjunctivitis ($r= 0.505$) resp.

Arthritis correlated non -significant negatively with conjunctivitis ($r=-0.036$) resp. All other correlation coefficients were not significant ($P>0.05$).

CONCLUSION

- There was highly significant effect of housing systems on calf's diarrhea and pneumonia infection; also winter season was associated with the highest incidence of calves' deceases. Which confirm that 1) the importance of warming the calves, especially through good and comfortable bedding; 2) Protect the calves from the air currents; 3) Maintaining the cleanliness of the bedding under the animals.
- The calves that born from 1st parity dams recorded the highest incidence of diarrhea, pneumonia, arthritis and conjunctivitis (36.99%, 33.70%, 46.66% and 31.18 % resp.), which need intensive care.
- Some calves diseases correlated positively or negatively significant ($P < 0.05$) with other diseases which needs more research studies. But the negative association between diarrhea and the rest of the diseases is due to the drugs and treatments, intensive care, used to treat diarrhea have an effect in preventing other diseases.

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تأثير رعاية القطيع والأمومة على إصابة العجول بالأمراض

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استخدمت في هذه الدراسة سجلات لعدد ١٨١٠ عجل هولشتاين فريزيان نامى من مزرعة البيومي التجارية للألبان (تقع في جمصة - محافظة الدقهلية بمصر) ، وذلك من مواليد ٢٠١٨ إلى ٢٠١٩م من الولادة وحتى الفطام لدراسة تأثير عوامل الإدارة والأمومة (نظام السكن، الموسم، الجنس، الوزن عند الولادة، عدد الولادات، الفترة بين الولادتين) على الأمراض المختلفة. وقد تم حساب معاملات الارتباط المختلفة بين الأمراض وبعضها محل الدراسة. تم إيواء العجول في نظامين سكنيين مختلفين. الأول محطة (١) (شبه داخلي)، وتم إيواء العجول فيها بشكل فردي في صناديق خاصة (بأرضية من الحديد معزولة بطبقة بلاستيكية ومرتفعة عن الأرض ٢٠ سم) لمدة ٢١ يوماً من بعد الولادة ثم يتم نقلها إلى صناديق تقليدية على فراش الرمل حتى الفطام. ومن ناحية أخرى، تم إيواء العجول في المحطة (٢) (أنظمة الإسكان الخارجي) مباشرة بعد الولادة في صناديق العجول التقليدية. تعرض حوالي ١٠٢٦ عجلاً بنسبة (٥٦,٦٦%) للأمراض المختلفة. أعلى نسبة حدوث للإسهال كانت ٥٣,١٥% في النظام شبه الداخلي بينما كانت ٤٦,٨٤% في النظام الخارجي. علاوة على ذلك، سجل النظام الخارجي أعلى معدلات الإصابة بالالتهاب الرئوي ومرض السرة والعرج والضعف والتهاب المفاصل والتهاب الملتحمة (٧١,٨٧%)، ١٠٠%، ٥٦,٥٠%، ٩٤,٩١%، ٥٣,٣٣% و ٧٤,١٩% على التوالي). ارتبط فصل الشتاء بأعلى نسبة للوفيات بين العجول لحالات مثل الالتهاب الرئوي والإسهال والتهاب المفاصل والضعف والعرج والتهاب الملتحمة (٣٧,٨٠%، ٤٢,٦٠%، ٣٦,٥٥%، ٤٠,٠٠%، ٣٨,٩٨% و ٣١,٢٥% على التوالي). مما يؤكد على أولاً: أهمية تدفئة العجول وخاصة من خلال الفراش الجيد والمريح في الشتاء، ثانياً: أهمية حماية العجول من التيارات الهوائية وثالثاً: المحافظة على نظافة الفراش الموجود تحت الحيوانات. سجلت الذكور أعلى معدلات الإصابة بالإسهال ($P<0.05$)، والالتهاب الرئوي ($P<0.01$)، وتكثرت الجلد ($P>0.05$)، والعرج ($P<0.05$)، والضعف ($P<0.01$)، والتهاب المفاصل ($P>0.05$)، والتهاب الملتحمة ($P<0.01$) ٦٥,٢٠%، ٦٣,٦٠%، ٨١,٣٠%، ٨٨,١٠%، ٦٦,٧٠%، ٦٨,٨٠%، ٥٦,٩٠% على التوالي). وقد يكون ذلك بسبب استخدام أنظمة الرضاعة الصناعية المعتمدة على بدائل الحليب للذكور فقط. ولم يكن للفترة بين الولادة أي تأثير معنوي ($P>0.05$) في حدوث أمراض العجول. سجلت العجول المولودة من أمهات الولادات الأولى أعلى معدلات الإصابة بالإسهال والالتهاب الرئوي والتهاب المفاصل والتهاب الملتحمة (٣٦,٩٩%، ٣٣,٧٠%، ٤٦,٦٦%، ٣١,١٨%) على التوالي، والتي تحتاج إلى رعاية مركزة. ترتبط بعض أمراض العجول ارتباطاً إيجابياً أو سلبياً معنواً ($P<0.05$) مع أمراض أخرى تحتاج إلى المزيد من الدراسات البحثية. لكن الارتباط السلبي بين الإسهال وبقيّة الأمراض يرجع إلى أن أدوية وعلاجات العناية المركزة المستخدمة لعلاج الإسهال قد يكون لها تأثير في الوقاية من بعض الأمراض أخرى.